WHAT IS CLAIMED IS:

1. A multispectral imaging system, comprising:

a photodetector; and

a wavelength separation device comprising a metal film or a plurality of metal islands having a two dimensional array of a plurality of openings having a width that is less than at least one first predetermined wavelength of incident radiation to be provided onto the film or the islands;

wherein:

the metal film or islands are configured such that the incident radiation is resonant with at least one plasmon mode on the metal film or metal islands; and

transmission of radiation having at least a second peak wavelength and a third peak wavelength different from the second peak wavelength is enhanced through the plurality of openings in the metal film or the plurality of metal islands due to the resonance with the at least one plasmon mode.

2. The system of claim 1, wherein:

the metal film or metal islands comprise a single film or layer of metal islands, or the metal film or metal islands comprise one of a plurality of stacked metal films or layers of metal islands;

the metal film or metal islands comprise a two dimensional array of cells;

each cell comprises a plurality of subcells;

a first period of first openings in a first subcell of a first cell is different than a second period of second openings in a second subcell of the first cell;

a transmission of the radiation having the second peak wavelength through the first openings in the first subcell is enhanced due to the first period; and

a transmission of the radiation having the third peak wavelength through the second openings in the second subcell is enhanced due to the second period.

3. The system of claim 2, wherein:

the metal film or metal islands comprise at least ten cells;

a period of openings in each subcell in each of the cells is different than periods of openings in at least some other subcells in each of the cells; and

a transmission of the radiation having a different peak wavelength through openings in each subcell is enhanced due to the period of the openings in the respective subcell.

4. The system of claim 3, wherein the openings in each subcell comprise slit shaped openings oriented in the same direction.

5. The system of claim 4, wherein:

each cell comprises at least three pairs of subcells;

a period of openings in each subcell of each pair of subcells is the same;

a period of openings in each pair of subcells in a given cell is different from a period of openings in other pairs of subcells in the same cell; and

the openings in each subcell of each pair of subcells are oriented perpendicular to each other.

6. The system of claim 5, wherein each subcell is adapted to transmit a different color of visible light to the photodetector.

7. The system of claim 5, wherein each subcell is adapted to transmit a different narrow band of UV or IR radiation to the photodetector.

8. The system of claim 1, wherein the wavelength separation device comprises a plurality of self assembled metal islands located on a radiation transparent substrate.

9. The system of claim 8, wherein the substrate comprises a plurality of ridges and the metal islands are formed asymmetrically on the plurality of ridges.

10. The system of claim 1, wherein the photodetector comprises a CCD array, a CMOS active pixel array or a focal plane array optically coupled to the metal film or the metal islands without utilizing diffractive optics.

11. The system of claim 1, wherein the photodetector is optically coupled with the wavelength separation device and adapted to detect a radiation transmitted through the wavelength separation device, the transmitted radiation having a plurality of different peak wavelengths enhanced by resonance with a plasmon mode on the metal film or metal islands of the wavelength separation device.

12. The system of claim 11, wherein each pixel of the photodetector corresponds to a cell of the wavelength separation device.

13. The system of claim 12, further comprising a processor adapted to determine an intensity of radiation detected by each cell of the photodetector.

14. The system of claim 1, wherein the system comprises a digital color camera.

15. An optical analyte detection system, comprising:

a photodetector;

a wavelength separation device comprising:

a metal film or a plurality of metal islands having a plurality of openings having a width that is less than at least one first predetermined wavelength of incident radiation to be provided onto the film or the islands;

wherein the metal film or islands are configured such that the incident radiation is resonant with at least one plasmon mode on the metal film or metal islands, and transmission of radiation having at least a second peak wavelength and a third peak wavelength different from the second peak wavelength is enhanced through the plurality of openings in the metal film or the plurality of metal islands due to the resonance with the at least one plasmon mode;

an excitation source adapted to cause analyte to emit radiation; and

a processor which is adapted to determine information about an analyte from radiation emitted by the analyte and detected by the imaging system.

16. The system of claim 17, wherein the excitation source comprises an optical excitation source.

17. The system of claim 16, further comprising a polarizing filter between the optical excitation source and the wavelength separation device.

18. The system of claim 15, wherein the wavelength separation device comprises a metal film or a plurality of metal islands having a two dimensional array of a plurality of openings having a width that is less

than at least one first predetermined wavelength of incident radiation to be provided onto the film or the islands.

19. A multispectral imaging system, comprising:

a first means for separating incident radiation into transmitted radiation having a plurality of peak wavelengths enhanced by resonance with a plasmon mode on the first means;

a second means for detecting the transmitted radiation; and

a third means for forming a color image of the incident radiation.

20. The system of claim 19, wherein:

the transmitted radiation comprises visible light separated by color; and

the third means comprises a means for forming the color image in a computer readable medium, on a display or on a visually observable tangible medium.

21. An optical analyte detection system, comprising:

a first means for causing analyte to emit first radiation;

a second means for separating first radiation into transmitted radiation having a plurality of different of peak wavelengths enhanced by resonance with a plasmon mode on the second means;

a third means for detecting the transmitted radiation; and

a fourth means for determining information about the analyte from the detected transmitted radiation.

22. The system of claim 21, further comprising an analyte holder.

23. The system of claim 22, wherein the fourth means is a means for determining medical or biological information about the analyte

located on the analyte holder based on a location on the analyte holder of the analyte which emits the first radiation.

24. A method of making a multispectral imaging system, comprising:

providing a solid state photodetector array in or over a substrate;

monolithically depositing a metal film on the photodetector array; and

photolithographically patterning the metal film to form a two dimensional array of a plurality of openings having a width that is less than at least one first predetermined wavelength of incident radiation to be provided onto the film, such that a transmitted radiation through the plurality of openings will have a plurality of different peak wavelengths enhanced by resonance with a plasmon mode on the metal film.

25. A method of making a multispectral imaging system, comprising:

providing a solid state photodetector array in or over a substrate; and

monolithically depositing a plurality of metal islands on the photodetector array, wherein the plurality of metal islands are separated by a two dimensional array of openings having a width that is less than at least one first predetermined wavelength of incident radiation to be provided onto the metal islands, such that a transmitted radiation through the plurality of openings will have a plurality of different peak wavelengths enhanced by resonance with a plasmon mode on the metal film.

26. A method of forming a color image, comprising:

providing incident radiation having a range of wavelengths onto

a metal film or a plurality of metal islands having a two dimensional array of a plurality of openings having a width that is less than at least one first predetermined wavelength of incident radiation, such that the incident radiation is resonant with at least one plasmon mode on the metal film or metal islands; and

providing transmitted radiation through the plurality of openings such that the transmitted radiation is simultaneously separated into a plurality of passbands having different peak wavelengths;

detecting the transmitted radiation; and

forming a color image based on the detected transmitted radiation.

27. A method of determining information about an analyte, comprising:

causing the analyte to emit first radiation;

separating the first radiation into transmitted radiation having a plurality of different wavelengths enhanced by resonance with a plasmon mode on a wavelength separation device;

detecting the transmitted radiation; and

determining information about the analyte from the detected transmitted radiation.

28. The method of claim 27, wherein:

the analyte comprises a biological material attached to a fluorophore; and

the first radiation comprises radiation emitted by the fluorophore.

29. The method of claim 28, wherein the step of determining information comprises determining medical or biological information about the analyte based on a location of the analyte which emits the first radiation.

30. A method of making a nanostructured device, comprising:

providing a metal film; and

photolithographically patterning the metal film to form a plurality of openings in the metal film, such that the plurality of openings have a width that is less than at least one first predetermined wavelength of incident radiation to be provided onto the film and transmission of radiation is enhanced through the plurality of openings in the metal film due to a resonance with the at least one plasmon mode on the metal film.

31. The method of claim 30, wherein the step of photolithographically patterning the metal film comprises:

forming a photoresist on the metal film;

holographically exposing the photoresist;

patterning the photoresist; and

patterning the metal film using the patterned photoresist to form a plurality of subwavelength slit shaped openings in the metal film.

32. A wavelength separation device comprising:

a metal film or a plurality of metal islands having a plurality of openings having a width that is less than at least one first predetermined wavelength of incident radiation to be provided onto the film or the islands;

wherein:

the metal film or islands are configured such that the incident radiation is resonant with at least one plasmon mode on the metal film or metal islands; and

transmission of radiation having at least a second peak wavelength and a third peak wavelength different from the second peak wavelength is enhanced through the plurality of openings in the metal film or the

plurality of metal islands due to the resonance with the at least one plasmon mode.

33. The device of claim 32, wherein:

the metal film or metal islands comprise at least two cells;

a first period of first openings in the first cell is different than a second period of second openings in a second cell; and

a transmission of the radiation having the second peak wavelength through the first openings in the first cell is enhanced due to the first period; and

a transmission of the radiation having the third peak wavelength through the second openings in the second cell is enhanced due to the second period.

34. The device of claim 33, wherein:

the metal film or metal islands comprise at least ten cells;

a period of openings in each of the cells is different than periods of openings in each of the other cells; and

a transmission of the radiation having a different peak wavelength through openings in each cell is enhanced due to the period of the openings in the respective cell.

35. The device of claim 34, wherein:

the metal film or metal islands comprise at least thirty cells;

a period of openings in each of the cells is different than periods of openings in each of the other cells;

a transmission of the radiation having a peak wavelength through openings in each cell is enhanced due to the period of the openings in the respective cell; and

radiation transmitted through each cell has a peak wavelength that differs by at least 10 nm from peak wavelengths of radiation transmitted through the other cells.

36. The device of claim 33, wherein the period of openings across the metal film or metal islands is chirped.

37. The device of claim 35, wherein a period of openings in each cell ranges from about 250 nm to about 700 nm and a width of each opening ranges from about 20 nm to about 80 nm.

38. The device of claim 32, wherein:

the metal film or metal islands comprise at least two cells;

each cell comprises at least one of a plurality of openings;

at least one surface of the metal film or metal islands in a first cell contains a first periodic or quasi-periodic surface topography provided adjacent to openings in the first cell, such that the transmission of the radiation having the second peak wavelength is enhanced due to a configuration of the first surface topography;

at least one surface of the metal film or the metal islands in a second cell contains a second periodic or quasi-periodic surface topography provided adjacent to openings in the second cell, such that the transmission of the radiation having the third peak wavelength is enhanced due to a configuration of the second surface topography which is different from the first periodic surface topography.

39. The device of claim 38, wherein:

the metal film or metal islands comprise at least ten cells;

a periodic or quasi-periodic surface topography configuration in each of the cells is different than periodic or quasi-periodic surface topography configurations in each of the other cells; and

a transmission of the radiation having a different peak wavelength through openings in each cell is enhanced due to the configuration of the periodic or quasi-periodic surface topography in the respective cell.

40. The device of claim 39, wherein:

the metal film or metal islands comprise at least thirty cells;

a periodic or quasi-periodic surface topography configuration in each of the cells is different than periodic or quasi-periodic surface topography configurations in each of the other cells;

a transmission of the radiation having a different peak wavelength through openings in each cell is enhanced due to a period of surface features of the periodic or quasi-periodic surface topography in the respective cell; and

radiation transmitted through each cell has a peak wavelength that differs by at least 1 nm from peak wavelengths of radiation transmitted through the other cells.

41. The device of claim 32, wherein the openings comprise slits located in the metal film, the slits having a length that is at least ten times larger than the width.

42. The device of claim 32, wherein the openings comprise circular, oval or polygonal openings in the metal film.

43. The device of claim 32, wherein the device comprises a plurality of self assembled metal islands located on a radiation transparent substrate.

44. The device of claim 43, wherein the substrate comprises a plurality of ridges and the metal islands are formed asymmetrically on the plurality of ridges.

45. The device of claims 32, wherein the metal film or metal islands are located in nanopores of a nanopore array substrate, and the openings are located above ridges of the nanopore array.

46. The device of claim 36, wherein:

the device comprises an N channel monochromator having N cells, where N is an integer between 10 and 10,000;

each cell size is about 50 to about 500 microns;

each cell contains at least one opening in the metal film or metal islands; and

each cell is adapted to enhance transmission of radiation having a different peak wavelength than a peak wavelength of radiation transmitted through the other cells.

47. The device of claim 46, wherein the monochromator length, width and thickness are each less than 1 cm.

48. A spectrum analyzer comprising:

the device of claim 32; and

a photodetector.

49. The analyzer of claim 48, wherein the photodetector comprises a CCD array, a CMOS active pixel array or a focal plane array optically coupled to the metal film or the metal islands without utilizing diffractive optics.

50. A spectrum analyzer device, comprising:

a wavelength separation device comprising a metal film or metal islands having a plurality of openings having a width that is less than at least one first predetermined wavelength of incident radiation to be provided onto the film or islands; and

a photodetector optically coupled with the wavelength separation device and adapted to detect a radiation transmitted through the wavelength separation device, the transmitted radiation having a range of peak wavelengths enhanced by resonance with a plasmon mode on the metal film or metal islands of the wavelength separation device.

51. The device of claim 50, wherein:

the wavelength separation device comprises at least thirty cells;

a period of openings in each of the cells is different than periods of openings in each of the other cells;

a transmission of the radiation having a peak wavelength through openings in each cell is enhanced due to the period of the openings in the respective cell;

radiation transmitted through each cell has a peak wavelength that differs by at least 1 nm from peak wavelengths of radiation transmitted through the other cells;

the photodetector comprises an array of solid state photodetector cells; and

each photodetector cell is configured to detect radiation having a predetermined peak wavelength from each respective cell of the wavelength separation device.

52. The device of claim 51, wherein the photodetector comprises a CCD array.

53. The device of claim 51, wherein the photodetector comprises a CMOS active pixel array.

54. The device of claim 50, wherein:

the wavelength separation device comprises at least thirty cells;

a periodic or quasi-periodic surface topography configuration in each of the cells is different than periodic or quasi-periodic surface topography configurations in each of the other cells;

a transmission of the radiation having a different peak wavelength through openings in each cell is enhanced due to a period of surface features of the periodic or quasi-periodic surface topography in the respective cell;

radiation transmitted through each cell has a peak wavelength that differs by at least 1 nm from peak wavelengths of radiation transmitted through the other cells;

the photodetector comprises an array of solid state photodetector cells; and

each photodetector cell is configured to detect radiation having a predetermined peak wavelength from each respective cell of the wavelength separation device.

55. The device of claim 50, wherein the analyzer contains no diffractive optics between the wavelength separation device and the photodetector.

56. The device of claim 50, wherein the period of openings across the metal film or islands is chirped.

57. The device of claim 50, further comprising a processor adapted to determine an intensity of radiation detected by each cell of the photodetector.

58. The device of claim 50, wherein the spectrum analyzer thickness in a radiation transmission direction is less than 1 cm and the spectrum analyzer length perpendicular to the radiation transmission direction is less than 1 cm.

59. A spectrum analyzer device, comprising:

a first means for separating incident radiation into transmitted radiation having a range of peak wavelengths enhanced by resonance with a plasmon mode on the first means; and

a second means for detecting the transmitted radiation.

60. A wavelength separation device comprising:

a support; and

a first means for receiving incident radiation such that the incident radiation is resonant with at least one plasmon mode on the first means, and for transmitting radiation having at least a second peak wavelength and a third peak wavelength different from the second peak wavelength, such that the transmitted radiation is enhanced due to the resonance with the at least one plasmon mode.

61. A method of making spectrum analyzer device, comprising:

providing a solid state photodetector array in or over a substrate;

monolithically depositing a metal film on the photodetector array; and

photolithographically patterning the metal film to form a plurality of openings having a width that is less than at least one first predetermined wavelength of incident radiation to be provided onto the film, such that a transmitted radiation through the plurality of openings will have a range of peak wavelengths enhanced by resonance with a plasmon mode on the metal film.

62. The method of claim 61, wherein:

the metal film comprises at least thirty cells;

a period of openings in each of the cells is different than periods of openings in each of the other cells;

a transmission of the radiation having a peak wavelength through openings in each cell is enhanced due to the period of the openings in the respective cell;

radiation transmitted through each cell has a peak wavelength that differs by at least 1 nm from peak wavelengths of radiation transmitted through the other cells;

the photodetector array comprises an array of solid state photodetector cells; and

each photodetector cell is configured to detect radiation having a predetermined peak wavelength from each respective cell of the metal film.

63. The method of claim 62, wherein providing a solid state photodetector array comprises photolithographically forming a CCD array in or on the substrate.

64. The method of claim 62, wherein providing a solid state photodetector array comprises photolithographically forming CMOS active pixel array.

65. The method of claim 61, further comprising photolithographically forming a periodic or quasi-periodic surface topography configuration on the metal film.

66. The method of claim 61, wherein:

the metal film comprises at least thirty cells;

a periodic or quasi-periodic surface topography configuration in each of the cells is different than periodic or quasi-periodic surface topography configurations in each of the other cells

a transmission of the radiation having a different peak wavelength through openings in each cell is enhanced due to a period of surface

features of the periodic or quasi-periodic surface topography in the respective cell;

radiation transmitted through each cell has a peak wavelength that differs by at least 1 nm from peak wavelengths of radiation transmitted through the other cells;

the photodetector comprises an array of solid state photodetector cells; and

each photodetector cell is configured to detect radiation having a predetermined peak wavelength from each respective cell of the wavelength separation device.

67. A method of making spectrum analyzer device, comprising:

providing a solid state photodetector array in or over a substrate; and

monolithically depositing a plurality of metal islands on the photodetector array, wherein the plurality of metal islands are separated by openings having a width that is less than at least one first predetermined wavelength of incident radiation to be provided onto the metal islands, such that a transmitted radiation through the plurality of openings will have a range of peak wavelengths enhanced by resonance with a plasmon mode on the metal film.

68. The method of claim 67, wherein:

the metal islands comprises at least thirty cells;

a period of openings in each of the cells is different than periods of openings in each of the other cells;

a transmission of the radiation having a peak wavelength through openings in each cell is enhanced due to the period of the openings in the respective cell;

radiation transmitted through each cell has a peak wavelength that differs by at least 1 nm from peak wavelengths of radiation transmitted through the other cells;

the photodetector array comprises an array of solid state photodetector cells; and

each photodetector cell is configured to detect radiation having a predetermined peak wavelength from each respective cell of the metal film.

69. The method of claim 68, wherein providing a solid state photodetector array comprises photolithographically forming a CCD array in or on the substrate.

70. The method of claim 68, wherein providing a solid state photodetector array comprises photolithographically forming CMOS active pixel array.

71. The method of claim 67, further comprising:

photolithographically forming a periodic or quasi-periodic surface topography configuration on the metal islands;

the metal islands comprise at least thirty cells;

a periodic or quasi-periodic surface topography configuration in each of the cells is different than periodic or quasi-periodic surface topography configurations in each of the other cells;

a transmission of the radiation having a different peak wavelength through openings in each cell is enhanced due to a period of surface features of the periodic or quasi-periodic surface topography in the respective cell;

radiation transmitted through each cell has a peak wavelength that differs by at least 1 nm from peak wavelengths of radiation transmitted through the other cells;

the photodetector comprises an array of solid state photodetector cells; and

each photodetector cell is configured to detect radiation having a predetermined peak wavelength from each respective cell of the wavelength separation device.

72. A wavelength separation method, comprising:

providing incident radiation having a range of wavelengths onto a metal film or a plurality of metal islands having a plurality of openings having a width that is less than at least one first predetermined wavelength of incident radiation, such that the incident radiation is resonant with at least one plasmon mode on the metal film or metal islands; and

providing transmitted radiation through the plurality of openings such that the transmitted radiation is simultaneously separated into a plurality of passbands having different peak wavelengths.

73. The method of claim 72, further comprising separately detecting each transmitted radiation passband.

74. A surface plasmon resonant optical device, comprising:

a radiation transparent substrate; and

a plurality of metal islands on the substrate;

wherein:

adjacent metal islands are separated by a distance that is less than at least one first predetermined wavelength of incident radiation to be provided onto the device; and

the metal islands are configured such that the incident radiation is resonant with at least one plasmon mode on the metal islands, thereby

enhancing transmission of radiation having at least one second peak wavelength between the plurality of metal islands.

75. The device of claim 74, wherein the first and the second wavelengths are 700 nm or less and the adjacent islands are separated by less than 100 nm.

76. The device of claim 74, wherein array of transparent regions between the plurality of metal islands have a period, a_o, such that the transmission of the radiation between the plurality of metal islands is enhanced due to the period of the array of transparent regions.

77. The device of claim 76, wherein the transparent regions comprise slits having a length that is at least ten times larger than the width.

78. The device of claim 74, wherein the plurality of metal islands have a periodic surface topography provided on at least one surface of the metal islands such that the transmission of the radiation between the plurality of metal islands is enhanced due to the periodic surface topography.

79. The device of claim 78, wherein transparent regions between the metal islands comprise slits having a length that is at least ten times larger than the width.

80. The device of claim 76, wherein the period a_o is about 200 to about 700 nm for visible light incident radiation.

81. The device of claim 74, wherein the plurality of metal islands are located on a plurality of ridges on the transparent substrate.

82. The device of claim 81, wherein each one of the plurality of metal islands is located on a corresponding one of the plurality of ridges.

83. The device of claim 82, wherein each respective metal island extends over an upper surface of each ridge and over at least a portion of at least one side surface of each respective ridge.

84. The device of claim 83, wherein:

a length each metal island is at least 10 times larger than its width;

a length of each ridge is at least 10 times larger than its width; and

each metal island extends lower over a first side surface of a respective ridge than over a second side surface of the respective ridge.

85. The device of claim 84, wherein:

the plurality of ridges comprise a plurality of rectangular ridges; and

the substrate comprises one or more layers of radiation transparent material.

86. The device of claim 74, wherein the substrate comprises a nanopore array.

87. The device of claim 86, wherein the substrate comprises an anodic aluminum oxide nanopore array located over a radiation transparent substrate material.

88. The device of claim 74, wherein the plurality of metal islands comprise a plurality of discrete metal islands that are not connected to each other.

89. The device of claim 74, further comprising:

a radiation source adapted to emit the incident radiation having the at least one first predetermined wavelength; and

a radiation detector adapted to detect the radiation transmitted through the substrate and between the plurality of metal islands.

90. A method of making a surface plasmon resonant optical device, comprising:

providing a radiation transparent substrate; and

forming a plurality of metal islands on the transparent substrate; wherein:

adjacent metal islands are separated by a distance less than at least one first predetermined wavelength of incident radiation to be provided onto the device; and

the metal islands are configured such that the incident radiation is resonant with at least one plasmon mode on the metal islands, thereby enhancing transmission of radiation having at least one second peak wavelength between the plurality of metal islands.

91. The method of claim 90, wherein:

the substrate comprises a plurality of ridges on a first surface; and

the step of forming the plurality of metal islands comprises selectively depositing the metal islands on the plurality of ridges, such that metal is not deposited between the ridges.

92. The method of claim 91, wherein the step of selectively depositing comprises angle-depositing the metal islands by directing metal onto the ridges in a non perpendicular direction with respect to upper surfaces of the ridges.

93. The method of claim 92, wherein the ridges comprise a flat upper surface and the metal is directed at an angle of 20 to 70 degrees with respect to the flat upper surface.

94. The method of claim 19, wherein the step of selectively depositing comprises providing metal from a target onto the substrate, such that the substrate is inclined by 20 to 70 degrees with respect to the target.

95. The method of claim 91, further comprising forming the plurality of ridges using lithography.

96. The method of claim 95, wherein the step of forming the plurality of ridges comprises:

forming a photoresist layer on the first surface of the substrate; selectively exposing the photoresist layer;

patterning the exposed photoresist layer; and

etching the first surface of the substrate to form the ridges using the patterned photoresist layer as a mask.

97. The method of claim 96, wherein:

the step of selectively exposing the photoresist layer comprises holographically exposing the photoresist layer; and

the step of selectively depositing comprises angle-depositing the metal islands by directing metal onto the ridges in a non perpendicular direction with respect to upper surfaces of the ridges.

98. The method of claim 95, wherein the step of forming the plurality of metal islands comprises:

forming a first metal layer on a grating patterned transparent substrate, such that the grating pattern of the substrate is translated to an upper surface of the first metal layer, wherein said forming;

anodically oxidizing the first metal layer such that nanopores selectively form in troughs of the grating pattern in the upper surface of the first metal layer; and

selectively growing the metal islands in the nanopores.

99. The method of claim 95, wherein the step of forming the plurality of metal islands comprises:

forming a first metal layer on a grating patterned material such that the grating pattern of the material is translated to an upper surface of the first metal layer;

anodically oxidizing the first metal layer such that nanopores selectively form in troughs of the grating pattern in the upper surface of the first metal layer;

depositing a template material over the anodically oxidized first metal layer, such that template material ridges extend into the nanopores;

separating the template material from the anodically oxidized first metal layer; and

selectively forming the metal islands on the template material.

100. The method of claim 90, wherein the step of forming the plurality of metal islands comprises:

forming a metal layer on the substrate; and

patterning the metal layer into the plurality of metal islands.

101. The method of claim 100, wherein the step of patterning comprises:

forming a photoresist layer on a first surface of the metal layer;

selectively exposing the photoresist layer;

patterning the exposed photoresist layer; and

etching the metal layer into the plurality of islands using the patterned photoresist layer as a mask.

102. The method of claim 101, wherein the step of selectively exposing the photoresist layer comprises holographically exposing the photoresist layer.

103. The method of claim 90, wherein the step of forming the plurality of metal islands comprises:

forming a photoresist layer on the first surface of the substrate;

selectively exposing the photoresist layer;

patterning the exposed photoresist layer to expose portions of the first surface of the substrate;

forming a metal layer over the patterned photoresist layer and over exposed portions of the first surface of the substrate; and

lifting off the patterned photoresist layer and portions of the metal layer located on the patterned photoresist layer to leave a plurality of metal islands on the first surface of the substrate.

104. The method of claim 103, wherein the step of selectively exposing the photoresist layer comprises holographically exposing the photo resist layer.

105. A radiation transmission method, comprising:

providing a wavelength separation device comprising a radiation transparent substrate and a plurality of metal islands located on at least one surface of the substrate;

providing incident radiation onto the wavelength separation device; and

transmitting radiation having at least one first peak wavelength through the wavelength separation device;

wherein the incident radiation is resonant with at least one plasmon mode on the metal islands to enhance the radiation transmitted through the wavelength separation device.

106. The method of claim 105, wherein the incident radiation and the transmitted radiation comprise visible light.

107. The method of claim 106, wherein adjacent metal islands are separated by less than 100 nm and the visible light is transmitted between the metal islands.

108. The method of claim 107, wherein the at least one plasmon mode comprises surface plasmon resonance along a plane that comprise metal island/adjacent dielectric interface, and surface plasmon resonance localized along the metal island sidewalls.

109. The method of claim 108, wherein:

the transparent regions between metal islands comprise slits having a length that is at least ten times larger than the width; and

the slit width is selected such that surface plasmon excitation is off-tuned from the resonance points such that a net power flow along the metal surfaces funnels into the transparent regions and then decouples into radiation modes which form a propagating transmitted beam.

110. The method of claim 109, wherein the slit width is about one to about three penetration depths of the incident radiation into the metal islands.

111. The method of claim 109, wherein a ratio of an intensity of transmitted radiation at higher wavelengths to an intensity of a peak transmission of the main passband radiation is 0.4 or less.

112. The method of claim 105, wherein an array of transparent regions between the plurality of metal islands have a period, a_o, such that the transmission of the radiation between the plurality of metal islands is enhanced due to the period of the array of transparent regions.

113. The method of claim 112, wherein the transparent regions comprise slits having a length that is at least ten times larger than the width.

114. The method of claim 105, wherein the plurality of metal islands have a periodic surface topography provided on at least one surface of the metal islands such that the transmission of the radiation between the plurality of metal islands is enhanced due to the periodic surface topography.

115. The method of claim 113, wherein the period a_o is about 200 to about 700 nm.

116. The method of claim 105, wherein:

the plurality of metal islands are located on a plurality of ridges on the transparent substrate; and

each one of the plurality of metal islands is located on a corresponding one of the plurality of ridges.

117. The method of claim 105, wherein the plurality of metal islands comprise a plurality of discrete metal islands that are not connected to each other.

118. The method of claim 105, further comprising detecting the transmitted radiation.

119. A surface plasmon resonant optical device, comprising:

a radiation transparent substrate; and

a first means for receiving incident radiation and for transmitting radiation having at least one first peak wavelength, such that the incident radiation is resonant with at least one plasmon mode on the first means to enhance the radiation having the at least one first peak wavelength transmitted through the first means.

120. A surface plasmon resonant optical device, comprising:

a radiation transparent substrate;

a plurality of metal islands on the substrate; and

a plurality of slit shaped transparent regions separating the metal islands;

wherein:

the width of the transparent regions at their narrowest point ranges from about one to about three penetration depths of surface plasmon fields in the metal islands when incident radiation is provided on the metal islands.

121. The device of claim 120, wherein the islands are separated by less than 100 nm.

122. The device of claim 121, wherein the islands are separated about 40 nm to about 60 nm.

123. A surface plasmon resonant optical device, comprising a plurality of metal islands having at least one transparent region between the metal islands and a non-metal topography on the metal islands configured such that the incident radiation is resonant with at least one plasmon mode on the metal islands, thereby enhancing transmission of radiation having at least one peak wavelength between the plurality of metal islands.

124. The device of claim 123, wherein the non-metal topography comprises periodically or quasi-periodically arranged dielectric features on the metal islands.

125. The device of claim 123, wherein the non-metal topography comprises at least one dielectric layer on the metal islands having a variable refractive index.

126. A surface plasmon resonant optical device, comprising a metal film having at least one aperture and a non-metal topography on the metal film configured such that the incident radiation is resonant with at least one plasmon mode on the metal film, thereby enhancing transmission of radiation having at least one peak wavelength through the at least one aperture.

127. The device of claim 126, wherein the non-metal topography comprises periodically or quasi-periodically arranged dielectric features on the metal film.

128. The device of claim 126, wherein the non-metal topography comprises at least one dielectric layer on the metal film having a variable refractive index.

129. A surface plasmon resonant optical device, comprising two or more stacked metal films or two or more layers of metal islands, each metal film or layer of metal islands contains a two dimensional array of a plurality of openings having a width that is less than at least one first predetermined wavelength of incident radiation to be provided onto the film or the islands, wherein the metal film or islands are configured such that the incident radiation is resonant with at least one plasmon mode on the metal film or metal islands.

130. The device of claim 129, wherein the metal films or layers of metal islands are stacked substantially perpendicular to the incident radiation to be provided onto the device.

131. The device of claim 129, wherein the device is configured such that a radiation transmitted through the device comprises side peaks with a lower intensity, a lower background transmission and a reduced main passband width compared to radiation transmitted through a device comprising only a single metal film or a single layer of metal islands.

132. The device of claim 129, wherein openings in the first metal film or in the first layer of metal islands are offset from corresponding openings in a second metal film or in a second layer of metal islands.

133. The device of claim 132, wherein the offset is selected to refine bandpass characteristics of the device by adjusting an overlap of the spectral profiles of the first and the second films or layers.